Examination October 2020

B.Sc. T.Y (Sem-V)

2166 Mathematics MAT - 502 Abstract Algebra - I

Time: One Hour **Max. Marks: 25**

Instructions :

Solve any 25 questions from Q 1 to Q 30

1 If G={2,4,6,8} is a group under the operation multiplication modulo 10, then the identity element in G is

(A)4 (B)6 (C)5 (D)9

2 If G={2,4,6,8} is a group under the operation multiplication modulo 10, then the inverse of 6 in G is

(A)4 (B)6 (C)2 (D)9

3 Read the following two statements and give the correct answer:

P: Every subgroup of a group is always a normal subgroup.

Q: Every subgroup of an abelian group is always a normal subgroup.

(A)Only P is correct (B)Only Q is correct (C)Both P and Q are correct (D)Both P and Q are not correct.

4 If G={-3n\n is any integer }is a group under addition then order of G is

(A)1 (B)2 (C)countable infinite (D)zero

5 Under which operation the set G={-3n\n is any integer } would be an abelian group

(A)Addition (B)Subtraction (C)Multiplication (D)Division

6 If are elements of a group G then the law $(ab)^{-1}=b^{-1}a^{-1}$ called as

(A)Inverse law (B)Identity law (C)Inverse reverse law (D)Closure property

7 If G is the collection of all 2 ×2 real matrices then which of the following is correct

(A)G is a group with respect to matrix addition. (B)G is a group with respect to matrix multiplication. (C)G is an abelian group with respect to matrix multiplication. (D)G is not a group.

8 If G is the collection of all 2 ×2 real singular matrices then which of the following is not correct

(A)G is a group with respect to matrix addition. (B)G is a group with respect to matrix multiplication. (C)G is an abelian group with respect to matrix addition. (D)Inverse of each element in G does not exist in G.

9 If H is a subgroup of a finite group G, where order of G is 9 then which of the following is correct

(A)Order of H is 4. (B)Order of H is 5. (C)Order of H is 6. (D)Order of H is 3.

10 10) If N is a normal subgroup of a group G then for any $g\epsilon G$, which of the following is not correct

(A) gNg^{-1} is also a normal subgroup of G. (B) $g^{-1}Ng$ is also a normal subgroup of G. (C) Ng is also a normal subgroup of G. (D) $Ng=gN$

11 If N is a normal subgroup of G and H is a subgroup of G then

(A) $N\cap H$ is a normal subgroup of G. (B) $N\cap H$ is a normal subgroup of H. (C)Both (a) and (b) are correct. (D)Both (a) and (b) are not correct.

12 If N is a normal subgroup of G then

(A)(a) Every left coset of N in G is equal to right coset of N in G. (B)Product of two right cosets of N in G is again a right coset of N in G. (C)Both (a) and (b) are correct. (D)(d) Both (a) and (b) are not correct.

13 If G is a group then

(A)Every mapping ϕ from G into G is always a homomorphism of G. (B)Every homomorphism ϕ on G is always a mapping from G into G. (C)Both (a) and (b) are correct. (D)Both (a) and (b) are not correct.

14 If ϕ is a homomorphism of $G\,into\,\bar{G}$ with kernel K then

(A)K is a normal subgroup of G. (B)G/K is a quotient group. (C)Both (a) and (b) are correct. (D)Both (a) and (b) are not correct.

15 If ϕ is a homomorphism of $G\,into\,\bar{G}$ which is one-one and onto then

(A) ϕ is an isomorphism. (B) ϕ is an automorphism (C)Both (a) and (b) are correct. (D)Both (a) and (b) are not correct.

16 If two groups H and K are isomorphic to each other then

(A)H=K (B)Order of H = order of K. (C)H and K both are abelian groups. (D)If H is an abelian then K may not be an abelian.

17 Isomorphism of two groups is --------- relation.

(A)Reflexive (B)Symmetric (C)Transitive. (D)an equivalence.

18 Which of the following is a correct statement?

(A)If H is a subgroup of a group G then both H and G are having same binary operation. (B)Every subgroup of an abelian group is not a normal subgroup. (C)Product of two normal subgroups of G is not normal subgroup of G. (D)Every automorphism of G is not a homomorphism of G.

19 Which of the following is correct?

(A)A commutative ring which has no zero divisors is called integral domain. (B)If (R, +, *) is a ring then R is an abelian group under +. (C)Both (a) and (b) are correct. (D)Both (a) and (b) are not correct.

20 If $(R,+,X)$ is a ring, then for all $x, y \in, R$, which of the following is correct?

(A)X ×(additive inverse of y)=x×y
(B)X ×(additive inverse of y) = additive inverse of (x×y)
(C)X×(additive identity) = x
(D)X+(additive identity) = additive identity

21 Which of the following is correct?

(A)An integral domain with 100 elements is a field.
(B)Every ring is finite.
(C)Both (a) and (b) are correct.
(D)Both (a) and (b) are not correct.

22 Which of the following is correct?

(A)If D is an integral domain such that x + x + x=0 for every x in D then characteristic of D is 3.
(B)If D is an integral domain such that x + x= 0 for every x in D then characteristic of D is zero.
(C)Both (a) and (b) are correct.
(D)Both (a) and (b) are not correct.

23 If (R,+,X) is a ring such that x×x=x for every $x \in R$ x then R is a ----

(A)field
(B)Finite field
(C)Commutative ring
(D)non commutative ring.

24 If Φ is a homomorphism of a ring R into $\bar{R}$ defined by $\Phi(a)=0$ then

(A) Φ is a homomorphism.
(B)I(Φ)=R
(C) Φ is a zero homomorphism.
(D)all of the above.

25 A non-empty subset U of R is an ideal of R, it means that U is----

(A)Only left ideal of R.
(B)Only right ideal of R
(C)both left and right ideal of R.
(D)maximal ideal of R.

26 If U is an ideal of ring R with unit element then-----

(A)U is proper ideal of R.
(B)U is improper ideal of R.
(C)U={0}
(D)R=U

27 If U is subgroup of R under addition satisfying $ur \in U$ for all $r \in R$ then U is called as

(A)an ideal of R.
(B)left ideal of R.
(C)Right ideal of R
(D)abelian subgroup under multiplication.

28 A ring R whose only ideals are {0} and R itself then R is a field if R is/are----

(A)commutative
(B)with unit element.
(C)commutative with unit element.
(D)neither commutative nor with unit element.

29 If M is a maximal ideal of R which is commutative ring with unit element then----

(A)R is a field.
(B)R=M.
(C)R/M is not a field.
(D)R/M is a field.

30 If f(x) and g(x) are two nonzero elements of F[x] then which of the following is true?

(A)deg[f(x).g(x)]=deg[f(x)].deg[g(x)].
(B)deg[f(x).g(x)]=deg[f(x)]+ deg[g(x)].
(C)deg[f(x)+g(x)]=deg[f(x)].deg[g(x)].
(D)deg[f(x)+g(x)]=deg[f(x)]+ deg[g(x)]